

Identify and Apply Number Properties in Decimal Operations

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CONCEPT

1

Identify and Apply Number Properties in Decimal Operations

Here you'll identify and apply number properties in the addition, subtraction, multiplication and division of decimals.

Did you know that you can use the properties of multiplication and division to simplify numerical expressions? Take a look at this situation.

$$5(2 \cdot 3) \cdot 9$$

Do you know how to simplify this? Pay attention to this Concept and you will learn all about number properties in decimal operations.

Guidance

Do you remember working with properties?

A property is a rule that applies to mathematical statements.

The great thing about a property is that the rule has been proven so it is always true. Properties help us to understand certain ways of doing things in mathematics.

Here are two properties of addition that you have probably seen before.

Associative Property of Addition

The grouping of addends does not affect the sum: $4.5 + (2.1 + 9.6) = (4.5 + 2.1) + 9.6$

Commutative Property of Addition

The order of addends does not change the sum: $6.3 + 8.7 = 8.7 + 6.3$

Which of the following shows the Commutative Property?

- a. $x + 9.5 = 9.5x$
- b. $x - 9.5 = 9.5 - x$
- c. $x + 9.5 = 9.5 + x$

Consider choice a.

This equation states that a number added to 9.5 is equal to that number multiplied by 9.5. This is not correct.

Consider choice b.

This equation states that the difference of a number and 9.5 is equal to the difference of 9.5 and a number. This is not correct.

Consider choice c.

This equation states that the sum of a number and 9.5 is equal to the sum of 9.5 and a number. The Commutative Property states that the order of addends does not change the sum, so this is the correct equation.

You can also use properties to help you simplify numerical expressions.



That is a great question and the best way to understand it is to look at another one. Let's do that now.

Simplify: $10.5 + (3.2 + 4.5)$

You can use addition properties to reorganize this expression to make it easier to simplify.

First apply the commutative property.

$$10.5 + (3.2 + 4.5) = 10.5 + (4.5 + 3.2)$$

Then apply the associate property.

$$10.5 + (4.5 + 3.2) = (10.5 + 4.5) + 3.2$$

Now you can easily use mental math to find the sum.

$$(10.5 + 4.5) + 3.2 = 15 + 3.2 = 18.2$$

The answer is 18.2

To work with multiplication and division of decimals, we are going to use a few other properties. Here are the properties.

Associative Property of Multiplication

The grouping of numbers does not affect the product: $4.5 \times (2.1 \times 9.6) = (4.5 \times 2.1) \times 9.6$

Commutative Property of Multiplication

The order of numbers does not change the product: $6.3 \times 8.7 = 8.7 \times 6.3$

Distributive Property

The product of a number and a sum is equal to the sum of the individual products of addends and the number:

$$3.2(1.5 + 8.9) = (3.2 \cdot 1.5) + (3.2 \cdot 8.9)$$

We can also use properties to simplify variable expressions.

Simplify: $2.5(2.1x + 4.3y)$

The addends inside the parentheses cannot be combined because two different variables are being used, so you can use the distributive property to help you simplify the expression.

$$\text{Apply the distributive property: } 2.5(2.1x + 4.3y) = (2.5 \times 2.1x) + (2.5 \times 4.3y)$$

Then simplify: $(2.5 \times 2.1x) + (2.5 \times 4.3y) = 5.25x + 10.75y$

This is our answer.

Simplify each example by using properties.

Example A

$$6(3 \times 4) \times 7$$

Solution: 504

Example B

$$3.1 + 2.7 + 4.3$$

Solution: 10.1

Example C

$$6.2(4x - 3)$$

Solution: $24.8x - 18.6$

Now let's go back to the dilemma from the beginning of the Concept.

$$5(2 \cdot 3) \cdot 9$$

First, notice that we can use the order of operations here. We find the product of the terms inside the parentheses.

$$2 \times 3 = 6$$

$$5(6) \cdot 9$$

$$30 \cdot 9$$

The answer is 270.

Now you could have also worked with this example by changing the grouping through the associative property. Take a look.

$$(5 \cdot 2) \cdot 9 \cdot 3$$

The product would have been 10×27 which is simple to multiply.

The product is 270.

Vocabulary

Associative Property of Addition

states that the grouping of numbers does not impact the sum of those numbers.

Commutative Property of Addition

states that the order of the numbers as you add them does not impact the sum of those numbers.

Guided Practice

Here is one for you to try on your own.

Simplify using the distributive property.

$$4.5(2x + 2)$$

Solution

First we multiply the term outside the parentheses with both of the terms inside the parentheses.

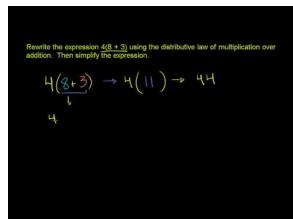
$$4.5(2x) + 4.5(2)$$

Now we multiply.

$$9x + 9$$

This is our answer.

Video Review



MEDIA

Click image to the left for more content.

[KhanAcademyTheDistributive Property](#)

Practice

Directions: Use the associative and commutative properties of addition to solve each problem.

1. $(7.2 + 9.1) + 3.2 = \underline{\hspace{2cm}}$
2. $5.4 + 2.1 + 5.4 = \underline{\hspace{2cm}}$
3. $(1.2 + 6.7) + 1.3 = \underline{\hspace{2cm}}$
4. $(4.1 + 9.2) + 9.0 = \underline{\hspace{2cm}}$
5. $(14.11 + 9.2) + 8.0 = \underline{\hspace{2cm}}$

Directions: Use what you have learned to solve each problem.

6. $(7 \times 9) + 3.2 = \underline{\hspace{2cm}}$
7. $15.4 + 2.1 - 5.4 = \underline{\hspace{2cm}}$
8. $(1.2 \times 6) + 1.3 = \underline{\hspace{2cm}}$
9. $(14.7 \div 2) + 9.0 = \underline{\hspace{2cm}}$
10. $(11.1 + 2) + 18.0 = \underline{\hspace{2cm}}$

Directions: Use the distributive property to simplify each expression.

11. $3.2(2x + 4) = \underline{\hspace{2cm}}$
12. $5.2(3x - 2) = \underline{\hspace{2cm}}$

13. $6.3(4y + 4) = \underline{\hspace{2cm}}$

14. $2.2(9a - 1) = \underline{\hspace{2cm}}$

15. $6.7(8x + 9) = \underline{\hspace{2cm}}$